

Media Briefing: Arecibo Observatory 305-meter telescope update

Dec. 3, 2020

Amanda Greenwell: And Public Affairs at the National Science Foundation. We want to thank you for joining us this morning for an update regarding the recent collapse of the 305-meter telescope at the Arecibo Observatory.

Before we start, I wanted to talk a little bit about the format for today's briefing. We are going to have panelists delivering a few brief remarks and then we will open it up for some questions. For the question and answer session, please look at the bottom of your Zoom screen. You should see a Q&A icon so please use that feature to enter in your questions and then I will read those to the panelists. We would ask that you wait to enter those questions until after the panelists have given their presentation.

So today we are going to be providing updates, following the collapse of the 305-meter telescope at Arecibo Observatory, and releasing two videos that show that footage. So again, this has been a really difficult week for all of us and our thoughts continue to be with the staff of Arecibo and the people of Puerto Rico. And we just remain grateful that no one was hurt.

On the line we have Ralph Gaume, Director of NSF's Astronomy Division and Program Officer Ashley Zauderer. We're also joined today by John Abruzzo of Thornton Tomasetti, contracted by the University of Central Florida, as the lead engineer of record for repairs and analysis on site at the 305-meter telescope.

Following the briefing, we will be distributing information for downloading the video for broadcast use. Now I'd like to turn it over to Ralph to start our briefing.

Ralph Gaume: Thank you, Amanda. As Amanda said, my name is Ralph Gaume, and I want to wish everybody a good morning. Before we get to the videos I wanted to provide just a few updates.

First, I want to express how deeply saddened we are here at NSF by the situation. And NSF is very thankful that no one was hurt. As you know, safety has always been and continues to be our top priority. Originally built by the Department of Defense, the Arecibo 305-meter telescope has been part of our NSF science family for approximately fifty years. And we will miss it.

NSF felt that the Arecibo telescope had a bright future with many impressive science results yet to come. In the summer of 2018, NSF made a \$5.8 million award to build an advanced 40 beam cryogenic phased array receiver that would have been deployed on the 305-meter telescope.

Just this last September, a month after the failure of the first cable, NSF had enough confidence in the future of the observatory and the 305-meter telescope that NSF provided funding for a

public-private partnership to build and deploy a next generation ultra-wideband receiver for the 305-meter telescope.

As I said, safety has always been and continues to be our top priority. As you will see from the videos we will play shortly, slightly after, or since the November 6 failure of the second cable on the Tower 4, the safety margins for the entire structure have been razor thin and the risks to safety significant.

Since the collapse, teams onsite have provided initial assessments indicate that the visitor centered fortunately did not sustain any serious damage under the collapse and an environmental team was onsite the day of the collapse, on Tuesday, assessing and addressing environmental concerns.

After the first cable failure on August 10, NSF immediately authorized our awardee, the University of Central Florida to utilize observatory operations and maintenance funds to execute all needed engineering analysis, forensics evaluation, and repairs. And now that we're in fiscal year 2021, NSF has provided full operations funding to Arecibo observatory, the funding that has been available to us under the continuing resolution.

And NSF is committed to provide all funding that will be appropriated by Congress during the balance of fiscal year 2021. On this point, let me be clear, since the failure, the first cable on August 10, our awardee UCF has had *all* necessary funds to proceed with stabilization and repair efforts. Lack of funding was not a limitation on the repair moving forward. I should also note that repair and replacements for the auxiliary cable that fell in August had been scheduled for delivery. And when the main cable broke on November 6, NSF authorized expedited delivery of temporary cables.

And I want to emphasize in my final point that NSF is *not* closing Arecibo Observatory. We have instructed the operator to repair the LIDAR facility and the 12-meter telescope. And we will be looking for ways to bring other parts of the observatory online as soon as possible. With that said, let me turn this over to Ashley Zauderer.

Ashley Zauderer: Thank you, Ralph. Good morning. Before we show you the videos, I wanted to give you an idea of the lay of the land at the observatory before this occurred. So this is a overhead view. You can see the main reflector here on the platform and then these smaller red circles are, the center point is where the three towers are, Tower 12, Tower 4 and Tower 8. As you can see, since November 6, when the main cable broke, NSF ordered the areas in these red circles to be restricted to anyone without NSF authorization. The other areas are designated as safety zones and the yellow lines are evacuation routes.

The keep out areas on this map were developed by one of the engineering firms under contract to UCF, Wiss, Janney, Elstner Associates, and was the basis for safety plans onsite.

You can see the telescope operations control center here, it's in a safe zone. And this is where one of the videos was shot that we'll will see shortly. When the 305-meter telescope platform

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collapsed, there was no one in these restricted areas, and initial assessment has indicated that all of the dangerous debris did fall within these restricted zones. All staff in the safety zones were evacuated safely, immediately after the collapse.

We will bring up the videos next. The first one, as I mentioned, was taken from the observatory control room here. The second one was captured by one of the drones that had been regularly surveying the status of the cables to monitor for broken wires and for us to understand the situation. The videos are very fast and we will watch them once and then have John take us back through them in more detail. Over to you, John.

John Abruzzo: Okay. Thank you, Ashley. So we'll start, to start I'm John Abruzzo. I am, basically work for Thornton Tomasetti and not part of the government. I was hired as a contractor by UCF. And so what I'll do is I'll show you these videos and kind of walk you through them.

So this first video was the one taken from the control room, it's farther away and you can see basically the platform suspended in the center of the screen. You see off in the distance, just to the left of center is Tower 4, okay. And you can, you can see, I hope, the cables that go from the top of Tower 4 to the platform. They are very faint in that, in the camera view, but they're there.

And so it's those cables that failed near the tower top first. And once those fail, the platform then loses stability and starts to come down. What you'll also see is kind of a catwalk that goes from near Tower 12 to the platform. That's suspended by a separate cable system and you'll see that in the next video. I'll point one of those cables out to you, because that system also collapsed as a consequence of the platform, but that's one of the last cables to go when you see it.

And when this plays, you'll see off to the left part of the top of Tower 12 coming down the hill and you'll see the top of Tower 4 being pulled backwards because we have the seven backstay cables still connected to the top of Tower 4, which have a lot of force in them to stabilize the platform in its condition here. But once those main cables release, the top of that tower is pulled backwards.

So let's play this video and, and you'll be able to see it. This will be real time so it, it goes relatively quickly.

So those towers, the tops of the towers that fell were about 62 feet long. So that was a big piece of reinforced concrete, that passed by. And so now why don't we go to the second video

Now, this was again, taken by the drone during one of its inspections. We, they were looking at the cables, and what you can see before we start this video, are the cables going to the, to the tower, going from the tower to the platform. So right under where it says Observatory Drone, there's three cables parallel to each other, all in a line.

You can see that some of the paint has flaked off of the first two of those three cables. Those are the main cables. Those are the ones that extend to the platform.

On the top, you see actually a wire rope, or cable, with a black strap around it. That strap was really there to take down the socket earlier in the fall. And that socket you can see in the bottom kind of center left is where that socket would have connected to the tower. That was the aux main cable that had failed earlier in August, it was connected to the tower top at that location.

So you see the three main cables. Those are the cables now carrying the platform from Tower 4. You see the upper cable, that's that wave guide cable. That's going to go to the wave guide system. And as we play this video, you'll see wires popping. And the wires, these ropes, right, are made up of several hundred wires. They, actually, the mains are approximately 170 wires. So as individual wires are breaking, you're losing some capacity of the rope. And at some point the demand on that rope is, is too high.

What you also see on the far right at the top is basically a slot with no cable in it and some frayed wires up at the top. That was the M 4 cable, or the Main 4 cable, that had failed on November 6. That's the remnants of it. It had failed near the near the socket here. And so that's missing.

And that and because of the aux main cable first breaking or failing in August, these four main cables were, had more, much more heavily loaded. And when that fourth cable then failed in November, there were only three cables left. And we knew at that point in time that, that it was just a matter of time and it was a very dangerous and precarious situation because they could have gone really at any time. And at the time this went, just happened to be when it went and the drone was over top.

So you'll see the video first and then we'll show it in slow motion after that. So start please.

So you see that center cable is starting to go there, it goes, the one in the left goes, and then the one on the right goes, the wave guide cable is still up, right? But now it goes as the other cables and the platform swings down and pulls that down. You see now the platform landing along the hillside at the top of the reflector, and you can see some of the top of Tower 12 tumbling down the hill and the visitor center virtually unscathed. There's a little bit of damage to it, but not much.

So the azimuth arm is, and the Gregorian dome are down further to the bottom of the reflector. And now in the video, you see the top of tower four is missing, actually the top 60 feet. That's what's left. And Tower 8 on the, on the left was the tallest of the towers. And we lost the top two sections, or 120 feet of that. So we'll start again in slow motion and you'll see, it was the middle one that goes first, then the one on the left, and then the one on the right. And then finally the wave guide.

And on the bottom, you can see the other aux main cable now that has failed. And you see the socket now bouncing around as it drops on that bottom right.

And the last cables to come down were those wave guide cables falling. And there you see, on the upper right, that Tower 12 tumbling. So those are the videos and Ashley, back to you.

Transcript by Rev.com

Ashley Zauderer: Before we go to questions, I just wanted to re-emphasize that as we move forward, NSF's priorities remain safety, working to mitigate any environmental issues, and finding ways to support the scientific community, the dedicated and talented staff at the Arecibo Observatory, and the people of Puerto Rico.

We recognize the significance of this loss to Puerto Rico and the significance of this loss to so many who have called the Arecibo Observatory home, whether it be for years or a week. Like many scientists, I spent time there as a graduate student. The telescope was special, suspended in a way that made it seem to float and to fight gravity. It inspired school children and visitors, and it inspired scientific discovery.

We are grateful to everyone who worked tirelessly to preserve the telescope and continue science, education and outreach in these difficult times. The staff at the observatory, at UCF, Yang Enterprises, the University at Ana Méndez, and the engineering firms. And finally, as we've mentioned, many times, we were thankful above all that the situation did not result in any injuries. And with that, I will pass it over to Amanda for questions.

Amanda Greenwell: Great. Thank you, Ashley. I just wanted to flag right before we're going to get into questions that you all should have received an email with the videos. If you have any issues downloading those, or have any questions, please email media@nsf.gov. So we're now gonna open it up for a brief question and answer period.

As a reminder with your questions, please put your name in, along with your outlet and use the Q and A button at the bottom of your zoom screen. Okay. We've got our first one coming in. Okay.

This is from Matt Kaplan. Okay. So where do we go from here? Can you talk about discussions to at least replace Arecibo's radar capabilities? And is there discussion of rebuilding? So Ralph or Ashley, do you want to start with that one?

Ralph Gaume: Yeah. Thanks. Thanks. I'll take that question. So as Ashley mentioned, our focus forward has to remain safety. The collapse just occurred Tuesday morning, and we need a full accounting of how stable the site is, in particular those towers, the three towers, and the remaining structure, along with putting together a plan to safely remove the wreckage. And concerns for safety extend to the environmental impact analysis and mitigation. So we're immediately working on those. So that's our immediate focus forward.

With regard to rebuilding, of course we're saddened by the loss, and as Ashley mentioned, we fully recognize the impact in the scientific community and to Puerto Rico. With regards to replacement, NSF has a very well-defined process for funding and constructing large scale infrastructure, including telescopes. It's a multi-year process that involves Congressional appropriations and the assessment and needs of the scientific community. So it's very early for us to comment on the replacement but in terms of replacement and rebuilding, all of those will be a factor in that decision moving forward.

Amanda Greenwell: Okay. Our next question is Alex Witzke of Nature. Were there engineer options that could have been taken more rapidly after the second cable failure in November that could have enabled a controlled descent of the platform rather than letting it collapse uncontrolled. Ashley.

Ashley Zauderer: Yeah, I'd be happy to take this question. So as soon as the second cable failed in November, the engineering firms did an analysis and there were a number of options for reducing the load on the cable. The most safe one was relaxing the backstays to slightly tilt the towers. And that was something that we were aggressively pursuing. They had the equipment, and the main thing that we were making sure was that the safety plan was adequate to begin that work.

As you can see, this was a very violent, and kind of unpredictable, failure. So we wanted to make sure that if we had workers at the backstay location doing that work, that they would be safe and, and their lives would not be in jeopardy, but that was being pursued very expediently.

There was a number of other options in terms of trying to remove some of the weight from the platform. That would have required work with a helicopter and people tethered. And it's, again, as you could see from the video, there was a lot of concerns about safety -- where the cables would be snapping, making sure that we would not put on the helicopter operator and the folks doing that in harm's way. But we were actively pursuing all of these options. But again, safety was the number one priority, such that anything that we did, and we wanted to make sure that we were not going to be putting workers in harm's way.

Ralph Gaume: If I could quickly add to that, once you get the videos downloaded and you look at that drone video, some of the last few frames in the drone video show those backstay cables for backstay 12 falling to the ground. Well, well, with damage, well behind, that is further north of Tower 12. That's exactly where crews would have been working had we gone with this, been able to go with this plan that Ashley meant, to relax, or that Ashley described to relax the backstay cables. So even that activity was very dangerous.

John Abruzzo: That's right. I can, I can add to that. And that that's exactly right. It was a dangerous situation. After the November 6 cable failure, those cables could have failed at any time. So it was, you were unable to predict when it would happen. We knew it would happen.

And also relieving the load. There were a lot of things that we had thought of to help relieve some of the load in those cables. You have to understand that we would've never been able to relieve enough load to get the cables back to the condition before November 6, where the one cable had failed. So it was risky to try and do what we were going to do. And, and frankly the probability of success was probably, was really not that high. It was just basically a last-ditch effort, if you could, to try and preserve it a little bit longer to allow us to do more work.

The helicopter approaches we had been considering. Again, that's correct, were very dangerous. It's very dangerous work. We know that there are power company people who do that, but they do that to transmission towers that are in good condition. This was a platform that we knew

could fail at any time. And so if you had to do something from a helicopter, they had to be in a position where if the platform fell, it would not impact the person hanging from the helicopter, right, or the pilot in the helicopter. So it was, there were not many options actually, you know, that, that were really at a high chance of really changing the game here.

Amanda Greenwell: Thanks, John. So next question is from Danica Coto of AP. So you answered part of this already, Ralph: are there plans to rebuild, if not, why not? Also what will happen to the \$10 million NSF still has that were meant to repair damage from Hurricane Maria. So maybe Ralph, if you just want to reiterate the process piece again and that obviously we're talking to the...

Ralph Gaume: Sure. So just to reiterate, NSF has a very well-defined process for building major research equipment and facilities that involves Congress appropriating funding along with an assessment and input by the scientific community, including research and other stakeholders. So that process would need to play out with regard to rebuilding Arecibo Observatory.

With regards to the hurricane repair funding, part of that repair funding was to effect repairs to the 305-meter dish. Part of that repair funding was to effect repairs to other things like the LIDAR system and the 12-meter telescope. We have recently instructed our awardee to go ahead and to make those repairs that are not related to the 305-meter telescope dish that just collapsed on Tuesday.

With regard to the funding that was allocated by Congress, appropriated by Congress, specifically for that purpose, we're working currently with OMB and with Congress to see if that, to find out and to figure out the disposition of those funds. Obviously they can't be spent on the original purpose. And so as Amanda might comment on, we always have to go back to Congress if we needed to reallocate those funds for a different purpose.

Ashley Zauderer: I wanted to also just weigh in here very quickly that from the hurricane repairs that were planned, one of the repair options was to replace a main cable on Tower 8 and this is not the cables that failed, that led to the collapse. And so that is the reason why these other activities associated with the repairs, in August, we gave immediate authorization, as Ralph said in his opening remarks, for UCF to use funding from their operations and maintenance award. Because it wasn't clear that the cable failure on Tower 4 was related to the hurricane, so we wanted them to have access to funds immediately. But just wanted to highlight that. Thank you.

Amanda Greenwell: Yeah. And one final clarification, again, as, as Ralph stated, Congress is one of our stakeholders, but we of course initiate that process. So just highlighting that there are many people involved in that. So next question from Brendan Byrne of NPR, what does the cleanup process look like? And what's the scope and time estimates, if any, at this point.

Ralph Gaume: Yeah. So we're still, if I could take that question, that'd be great. So we're still in the assessment process and we expect to have a full assessment of both the environmental impacts and a full damage assessment by the end of this week. As you can imagine there are,

there's widespread damage across not only the dish, but outside the dish with those backstay cables falling and the towers falling.

So we're in the assessment phase. However, our awardee does have a clean-up contractor that is currently onsite, has been onsite since yesterday. And they're beginning to make preliminary plans moving forward to provide us with a plan for what the cleanup looks like. So it's too early to say exactly what that cleanup looks like. We're still in the assessment, but we'll know soon.

Amanda Greenwell: Okay. We've got time for one more question. We've got Marcia Smith of Space Policy Online. Where were the cameras? Was the facility under 24/7 camera surveillance? Or did you anticipate this would happen soon and had them in place for that reason? Ashley, do you want to take that?

Ashley Zauderer: Yeah, I would be happy to. So again, the drone footage, I think we were just lucky, and the drone operator was very adept to see what was happening and be able to turn the camera. After the November 6 failure, the engineers had recommended that we do monitoring every couple hours to see where there are new wire breaks and to understand the structure. So that's how that video was taken. It was just part of an ongoing monitoring to, to count the number of wire breaks.

We had been counting more wire breaks over the weekend prior to the failure. And so, you know, that was a request to, to have monitoring. And that is that the main operations room where the view you saw that was kind of static. That's where the telescope operators actually sit when they were operating the telescope. And so that's where a camera was placed.

And as John had mentioned, you know, we had anticipated, it could be days or weeks. We didn't know when, so that's when that camera was actually put up.

In terms of 24/7 surveillance, it is important to note that was actually something part of the hurricane funding. It was something that we prioritized a number of tasks, and it had been lower on the totem pole, but that's something that I think will be important to get more surveillance, you know, onsite as the cleanup proceeds, but there was not, you know, surveillance cameras everywhere, just the ones that we showed today.

Amanda Greenwell: Thank you. And just to clarify as you'd said earlier, Ashley showing that that photo, there was no one in the safety zones when this occurred. So that was confirmed.

Okay, so again you should all have an email with links to the videos, also to a site where you can get more information on all of this. Also, if you have any questions or issues with those, please, again, email media@nsf.gov. We appreciate all of you making the time today and look forward to talking to you more. Have a good day.